(endocarp) is found thick, horny, and in all respects like that of J. nigra. The lower portion of the shell projects into the lower section of the nut, and resembles the point of a butternut. The engraving is from a carefully executed drawing, representing the nut of natural size.

The matter as above presented is left in the hands of those more familiar with subjects in teratology. There is no doubt that in the cross-fertilization of plants we may have a deviation from the parent form, even in the development of the seed thus fertilized, or in its surrounding parts. Some strawberry-growers are very careful what 'perfect' varieties are grown among their pistillate sorts to fertilize them. The fleshy receptacle, which is the edible portion of the strawberry, is more remote from the ovules which are fertilized on its surface than the covering of a shellbark or walnut is from the embryo within.

Hybridization between closely related genera is well established in several cases. Sachs mentions that it has been observed between species of Lychnis and Silene, Rhododendron and Azalea, Rhododendron and Rhodora, Azalea and Rhodora, Rhododendron and Kalmia, Aegilops and Triticum, and between Echinocactus, Cereus, and Phylocactus. The two genera Juglans and Carya compose a small order of closely related species. A study of the generic characters, as set down in the classification of these species, does not reveal any more striking difference than that shown in the exocarp. The male and female flowers are separated on the same tree (monoecious), and pollen must pass from flower to flower. This fertilizing-dust is produced in great abundance; and the distance between the black walnut and the pecan, or even the shellbark, is easily traversed by the pollen. There is probably no difficulty in the way of hybridizing from a difference of time in the flowering of the species. BYRON D. HALSTED.

New York, Oct. 26, 1883.

MANAYUNKIA SPECIOSA.

IN a paper, illustrated with a plate, recently presented to the Academy of natural sciences of Philadelphia, Professor Joseph Leidy describes Manayunkia as a cephalobranchiate annelid living in fresh water, the only one of the order yet discovered not living in the ocean. It was found with the equally remarkable polyzoan Urnatella, with its tubes of mud attached to the same stones, in the Schuylkill River, at Philadelphia. It was first noticed, and a brief description given of it, in the Proceedings of the academy in 1858.

Manayunkia is nearly related to the marine genus Fabricia, with a species of which, described by Professor Verrill, the writer compared it, through specimens collected at Newport, R.I., and Gloucester, Mass. Manayunkia has not been observed elsewhere until recently, when it was found by Mr. Edward Potts, attached to a fragment of pine bark from Egg-Harbor River, New Jersey.

The tubes of Manayunkia are simple or compound, and in one instance five tubes branched and were pendent from a common stock in a candelabra-like manner. The little worm is very active and sensitive, and on the slightest disturbance withdraws into its tube. When quiet it protrudes its head, and spreads its cephalic tentacles or branchiae. The mature worm is three or four millimetres long, and is divided into twelve segments, including the head. The color is olive-greenish, due to the bright green blood circulating in the vessels of the animal. The head is furnished with a pair of conspicuous eyes, and supports a lateral pair of lophophores, each provided with sixteen cylindrical tentacles, invested with actively moving cilia, and closely resembling those of the polyzoa. The segments succeeding the head are provided with lateral fascicles of locomotive setae, and in addition, except the first one, are further provided with fascicles of pedal hooks.

The seventh segment is much larger than any of the others, and further differs from them in being greatly expanded in front; so that it gave rise to the idea that the worm undergoes division, though the process was at no time observed. The intestine is quite simple. The chief portions of the vascular system consist in a vast sinus enclosing the intestinal canal, giving off lateral pairs of branches to the segments, and a large vessel which extends from each side of the head into one of the tentacles, which is larger than the others. The blood is bright green, and is observed to be incessantly pumped into and expelled from the larger pair of tentacles. Ovaries occupy the segments from the fourth to the sixth inclusive. Organs supposed to be the testes extend from within the head into the third segment.

Manayunkia lays its eggs and rears its young within its own tube. The young, measuring about three-fourths of a millimetre, had the body divided into nine segments, and each lophophore provided with four tentacles.

In the species of Fabricia of our coast the number of segments of the body is the same as in Manayunkia; but the lophophores supporting the tentacles, instead of being simple, are trilobed or trifurcate. Fabricia has eyes in the tail, or last segment, as well as in the head, which is not the case with Manayunkia.

DRAINAGE SYSTEM AND LOESS DISTRIBUTION OF EASTERN IOWA.

THESE are described by Mr. W. J. McGee in a recent communication to the Philosophical society of Washington. The Mississippi River, where it forms the eastern limit of Iowa, flows somewhat to the east

of south, and then as much to the west of south, giving the boundary an eastward angle in its middle part. The general strike of the rocks in eastern Iowa is south-east; and the dip, which is gentle, is south-west. The broadest outcrops are those of the Niagara and Hamilton formations. The Niagara, having resisted the prequaternary planation, holds an escarpment, the crest of which runs from the extreme eastern point of the state to a point on the Minnesota line fifty miles west of the Mississippi. From this line there is a somewhat rapid descent to the Mississippi, and a gentle slope south-westward to the broad, shallow depression marking the position of the Hamilton. From this valley the ascent is gentle to the water-parting between the Mississippi and Missouri. The general slope of the region west of the Niagara escarpment, considered as a whole, is with the dip to the south-west.

Beside the south-east trending depression marking the Hamilton outcrop, there is a gently sloped and indefinitely outlined but continuous and actual prequaternary valley, extending southward across the eastward projection of the state, and traversing diagonally the upper Silurian, Devonian, and carboniferous rocks.

The north-eastern angle of the state, from the crest of the Niagara escarpment to the Mississippi, belongs to the driftless region. The remainder of the state is covered with drift, and is affected by the undulations characteristic of drift topography.

The general directions of the rivers are from north-west to south-east; but their upper courses swerve a little toward the meridian, and their lower are deflected slightly toward the east, so as to give them a gentle curvature with concavity to the north-east. There is, moreover, a convergence northward, as though they radiated from some point in Minnesota. The variations from this normal system are so few that the drainage is almost unique in its regularity. It is likewise independent of the general topography; for not only do the principal streams flow at right angles to the prevailing slope, and cut through the elevated escarpment when it lies in their way, but, with a single exception, they preserve their courses across the ancient north and south valley.

In their relations to minor topographic features, they conform to two antagonistic laws, — first, they follow in general the ill-defined shallow valleys which characterize the drift-plains; and, second, they flow for one-third of their total courses in narrow gorges, following the axes of a system of elongated ridges which constitute the leading features in the local topography. Moreover, they have in many instances gone out of their direct courses, and deserted valleys seemingly prepared for them, to attain the anomalous positions assumed under the second law of association; and in every such case the gorges have demonstrably been carved by the streams themselves. The avoided valleys are evidently pre-existent: they have not been appreciably eroded since the quaternary, and there has been no recent localized orographic movement.

So the drainage is essentially independent of the general topography, though affected by local topography; and its relations to local topography are largely anomalous.

The loess of the region is continuous stratigraphically, but follows different laws of distribution in different districts. It constitutes the surface throughout the driftless region, and at the margin it overlaps the drift. In the northern part of the drift-covered area it forms narrow bands with a general north-west trend, each of which caps a ridge. Farther south it covers the entire plain, eminences and depressions alike. In the driftless area it rests on and merges into a thin stratum of water-worn erratic material. In the belts traversing the contiguous drift-plain it passes downward into sand, which may, or may not, merge into drift. Elsewhere it reposes on the drift, into which it graduates insensibly. The ridges in which the rivers have carved their anomalous cañons are always loess-topped; and, wherever streams avoid low-lying valleys for high-lying plateaus, the plateaus are of loess exteriorly.

So in its distribution the loess of eastern Iowa is intimately connected with the driftless region, with the drainage, and with the topographic configuration.

In the communication referred to, Mr. McGee offers no explanation, but merely sets forth the facts. His working hypothesis has, however, been published in an earlier paper (*Amer. journ. sc.*, Sept., 1882), and may properly be restated in this connection.

It is now many years since Powell first proposed to class all inconsequent drainage as either antecedent or superimposed; and no later writer has added to the number of categories. In *inconsequent* drainage the courses of the streams are independent of the dip and other structure-elements of the rocks across which they run. If the drainage is older than the rock-structure, — if, for example, the dip has been given to the rock after the establishment of the stream-courses, — the drainage is said to be *antecedent*. If the drainage was established by the configuration of an overlying and unconformable formation, which has disappeared by denudation, the drainage is said to be *superimposed*. In eastern Iowa, the superficial formation being northern drift, which lies with little modification as originally deposited, the hypothesis of antecedent drainage appears quite out of the question, while that of superimposed drainage in the ordinary sense is equally inapplicable. Mr. McGee's working hypothesis is, that the drainage was superimposed in an extraordinary manner; namely, by the ice-sheet. This, he finds reason to believe, was so thin in that region as to have its superficial configuration materially modified by the small inequalities of its bed. Where the ice was retarded by ridges underneath, more time was allowed for superficial waste by melting: so that hollows were produced, and the rivers of the ice-surface came to be established over the ridges of the glacier bed. With the disappearance of the ice, they were stranded upon the hill-tops.

G. K. GILBERT.